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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/032,523	10/19/2001	Hong-Da Liu	64,600-079	6871

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EXAMINER	
NGUYEN, HOAN C	
ART UNIT	PAPER NUMBER
2871	

DATE MAILED: 01/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/032,523	LIU ET AL.	
	Examiner	Art Unit	
	HOAN C. NGUYEN	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-14 and 16-20* is/are pending in the application.

4a) Of the above claim(s) *2 and 15* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 3-14 and 16-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Amendment

Applicant's arguments with respect to Amended claims 1 and 14 have been considered but are moot in view of the new ground(s) of rejection. Therefore, this is Final action.

Applicants cancelled claims 2 and 15. Therefore, ONLY claims 1, 3-14 and 16-20 are pending.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1, 3 10, 12,14 and16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1).

In regard to claims 1, 10, 12 and 14, Saito et al. teach (Figs. 1 and 10A-C) a liquid crystal on silicon structure incorporating integrated spacers and silicon light valves comprising:

- a silicon substrate SUB1 having
    - a first multiplicity of pixel electrodes AL-P formed on a top surface;

- a second multiplicity of integrated spacers SPC-P formed of an insulating material on said top surface of the silicon substrate in-between said first multiplicity of pixel electrodes;
- a third multiplicity of silicon light valves formed on said top surface of the silicon substrate for orienting liquid crystal molecules;

- a glass substrate SUB2 that is optically transparent having an optically transparent electrode layer coated on a bottom surface positioned juxtaposed to and over said silicon substrate supported by said second multiplicity of integrated spacers forming a sealed cavity by engaging a perimeter seal surrounding said two substrates, said sealed cavity encases said optically transparent electrode layer and said third multiplicity of silicon light valves therein; and a liquid crystal material filling said sealed cavity.

wherein

- each of said third multiplicity of silicon light valves being formed of a polysilicon tip and a dielectric material base (claim 10).
- each of said second multiplicity of integrated spacers having a height between about 0.5μm and about 10μm (claim 12) since the liquid crystal cell gap is about 4-7μm (col. 2 lines 10-12).

However, Saito et al. fail to disclose a liquid crystal comprising a multiplicity of multi-domain homeotropically aligned liquid crystal cell (claims 1 and 14) and a multiplicity of lines formed of insulating material protruding from said top surface of the

lower substrate for forming a multi-domain homeotropically aligned liquid crystal cell (claims 3 and 16) for high contrast ratio, a good display quality, and a high photo-stability

Lu et al. teach (Figs. 5A-B) a liquid crystal comprising a multiplicity of multi-domain homeotropically aligned liquid crystal cell (claims 1 and 14) and a multiplicity of lines formed of insulating material protruding from said top surface of the lower substrate for forming a multi-domain homeotropically aligned liquid crystal cell (claims 3 and 16) for high contrast ratio, a good display quality, and a high photo-stability (abstract).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with a multiplicity of multi-domain homeotropically aligned liquid crystal cell and a multiplicity of lines formed of insulating material protruding from said top surface of the lower substrate for forming a multi-domain homeotropically aligned liquid crystal cell (claims 3 and 16) for high contrast ratio, a good display quality, and a high photo-stability (abstract).

2. Claims 4 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1) as applied to claims 1, 3 10, 12,14 and16 in view of Kim et al. (US6525794B1).

Kim et al. teach (Figs. 3D and 4A-14B) a liquid crystal comprising a multiplicity of elongated recesses 43 formed in a metal layer on said top surface of the lower substrate for forming a fringe field homeotropically aligned liquid crystal cell for wide viewing angle by multi-domain and high brightness by stable arrangement of liquid crystal molecules.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with a multiplicity of elongated recesses 43 formed in a metal layer on said top surface of the lower substrate for forming a fringe field homeotropically aligned liquid crystal cell for wide viewing angle by multi-domain and high brightness by stable arrangement of liquid crystal molecules.

3. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1) as applied to claims 1, 3 10, 12,14 and16 in view of Iwaki et al. (US5646432)

Iwaki et al. teach a liquid crystal with each of said liquid crystal cell having a square configuration with a dimension of each side about 20μm, that is in a range between about 5μm and about 20μm for high speed (col. 15 lines 24-29).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with each of said liquid crystal cell having a square configuration with a

dimension of each side about 20μm, that is in a range between about 5μm and about 20μm for high speed

4. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1) as applied to claims 1, 3 10, 12,14 and16 in view of Bischel et al. (US5544268A)

Bischel et al. teach (col. 111 lines 52-57) a display panel with each of said liquid crystal cell having a square configuration with a distance to an immediate adjacent pixel less than 100μm that covers in a range between about 0.3μm and about 2μm for high resolution.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with each of said liquid crystal cell having a square configuration with a distance to an immediate adjacent pixel less than 100μm that covers in a range between about 0.3μm and about 2μm for high resolution.

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1) as applied to claims 1, 3 10, 12,14 and16 in view of Rosenblatt et al. (US5477358A)

Rosenblatt et al. teach (col. 2 lines 4-10) a liquid crystal material that fills said sealed cavity being a chiral-type liquid crystal for promoting homeotropic alignment of

the liquid crystal and exhibiting a uniform homeotropic alignment substantially throughout the cell.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with a liquid crystal material that fills said sealed cavity being a chiral-type liquid crystal for promoting homeotropic alignment of the liquid crystal and exhibiting a uniform homeotropic alignment substantially throughout the cell.

6. Claims 8 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1) as applied to claims 1, 3 10, 12,14 and16 in view of AKIMOTO et al. (JP361215522)

AKIMOTO et al. teach spacers being formed of silicon oxide for obtaining the titled apparatus having an excellent display quality.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with spacers being formed of silicon oxide for obtaining the titled apparatus having an excellent display quality.

7. Claims 9, 11 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1) as applied to claims 1, 3 10, 12,14 and16.

Saito et al. also disclose the top surface of the silicon substrate being covered by a layer of metallic reflective film (col.6 lines 33-34) for reflecting light.

However. Saito et al. fail to disclose said reflective metal layer formed by a metal selected from the group consisting of Al, Ag and Al--Nd.

It is well known in the art that the reflective metal layer made of Aluminum (Al) for low cost and easily manufacturing.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with the top surface of the silicon substrate being covered by a layer of metallic reflective film for reflecting light and this reflective metal layer made of Aluminum (Al) for low cost and easily manufacturing.

8. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1) as applied to claims 1, 3 10, 12,14 and16 in view of Nishio et al. (US6046547A).

Nishio et al. teach a liquid crystal display with each of said third multiplicity of silicon light valves having a height between about 0.3μm and about 3μm for eliminating irregularities caused by the TFT and treatment of flattening (col. 5 lines 56-61).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with each of said third multiplicity of silicon light valves having a height

between about 0.3μm and about 3μm for eliminating irregularities caused by the TFT and treatment of flattening.

Response to Arguments

Applicant's arguments filed on 10/21/03 have been fully considered but they are not persuasive.

Applicant's ONLY arguments are follows:

There can be no motivation to combine the teachings of Lu et al with Saito et al, and thus placing the multi-domain homeotropically aligned liquid crystal cells in the Saito et al's liquid crystal display device.

Examiner's responses to Applicants' ONLY arguments are follows:

Applicant admits that "Saito et al does not specify any specific liquid crystal material by stating, at col. 7, lines 5-6" (pages 13 lines 1-2 in Remarks). Thus, in a broad sense, any liquid crystal material can be used for different purposes. Besides, Saito also disclose "any domains that can occur at such part are invisible, which in turn ensures that the display characteristics are free from any possible degradation" (col. 15 lines 63-65). Thus, Saito implies the multi-domains can be used for increasing display characteristics.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with a multiplicity of multi-domain homeotropically aligned liquid crystal cell for high contrast ratio, a good display quality, and a high photo-stability.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HOAN C. NGUYEN whose telephone number is (703) 306-0472. The examiner can normally be reached on MONDAY-THURSDAY:8:00AM-4:30PM.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0530.

HOAN C. NGUYEN
Examiner
Art Unit 2871

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PRIMARY EXAMINER